HYDRONIC

Troubleshooting and repair instructions

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These Troubleshooting and Repair Instructions apply to the following heater versions:

HYDRONIC B	Cat. No.
B 5 W S — 12 Volts	20 1777 05 00 00
B 5 W S — 12 Volts / fully equipped	20 1778 05 00 00

HYDRONIC	Cat. No.
D 5 W S — 12 Volts	25 2031 05 00 00
D 5 W S — 12 Volts / fully equipped	25 2032 05 00 00
D 5 W S — 24 Volts	25 2009 05 00 00

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Functional description

The *HYDRONIC* can be wired up to operate as an auxiliary heater only or as a combination of auxiliary heater and add-heater — the latter serving to compensate for a lack of heat dissipation from the vehicle engine.

Auxiliary heater operation

Switching on

The pilot lamp in the operating element (timer module, switch, etc.) comes on when the *HYDRONIC* is switched on.
The water pump starts up, and after a defined pre-rinsing and preglow program has been completed the combustion air blower, glow plug and metering pump come on.
Once a flame has been detected and the combustion process has stabilised, a time control switches the glow plug off.

Heating mode

Depending on heat demand, the *HYDRONIC* alternates between "HIGH" and "LOW" settings.
The temperature thresholds are permanently programmed in the electronic control unit.
If the heat demand in the "LOW" setting is so low that the cooling water reaches a temperature of 85°C, the heater switches to the "OFF" setting, then continues to run for about 130 seconds.
The pilot lamp is also lit while the heater is in the "OFF" setting, and the water pump continues to run until the heater is restarted.

Switching off

When the heater is switched off, the pilot light goes out and fuel feed is shut off. Also in the case of *HYDRONIC* D 5 W S, the glow plug is switched on for 20 seconds.
The combustion air blower and the water pump run on after the heater is switched off (for 50 sec in the case of B 5 W S and for 120 sec in the case of D 5 W S) and are then switched off automatically.

Stationary ventilation

Stationary ventilation means that it is possible to activate the vehicle blower directly via the timer module or via radio wave remote control T4 bypassing heater operation in order to ventilate the vehicle interior — which often becomes extremely hot in the summer — before setting off (separate wiring, see Wiring diagram, pp. 24 and 25).

Diagnosis

If the control unit detects a fault at start-up of the *HYDRONIC* or while the *HYDRONIC* is in operation, it is indicated on the timer module display within 15 seconds in the form of a fault code (F + 2-digit number).
If the heater is operated in conjunction with the "Mini" timer, the fault code can be read out of the control unit by connecting a diagnostic unit (Cat. No. 22 1512 89 00 00). An adapter cable (Cat. No. 22 1000 30 71 00) is required in order to connect the diagnostic unit.

Safety devices

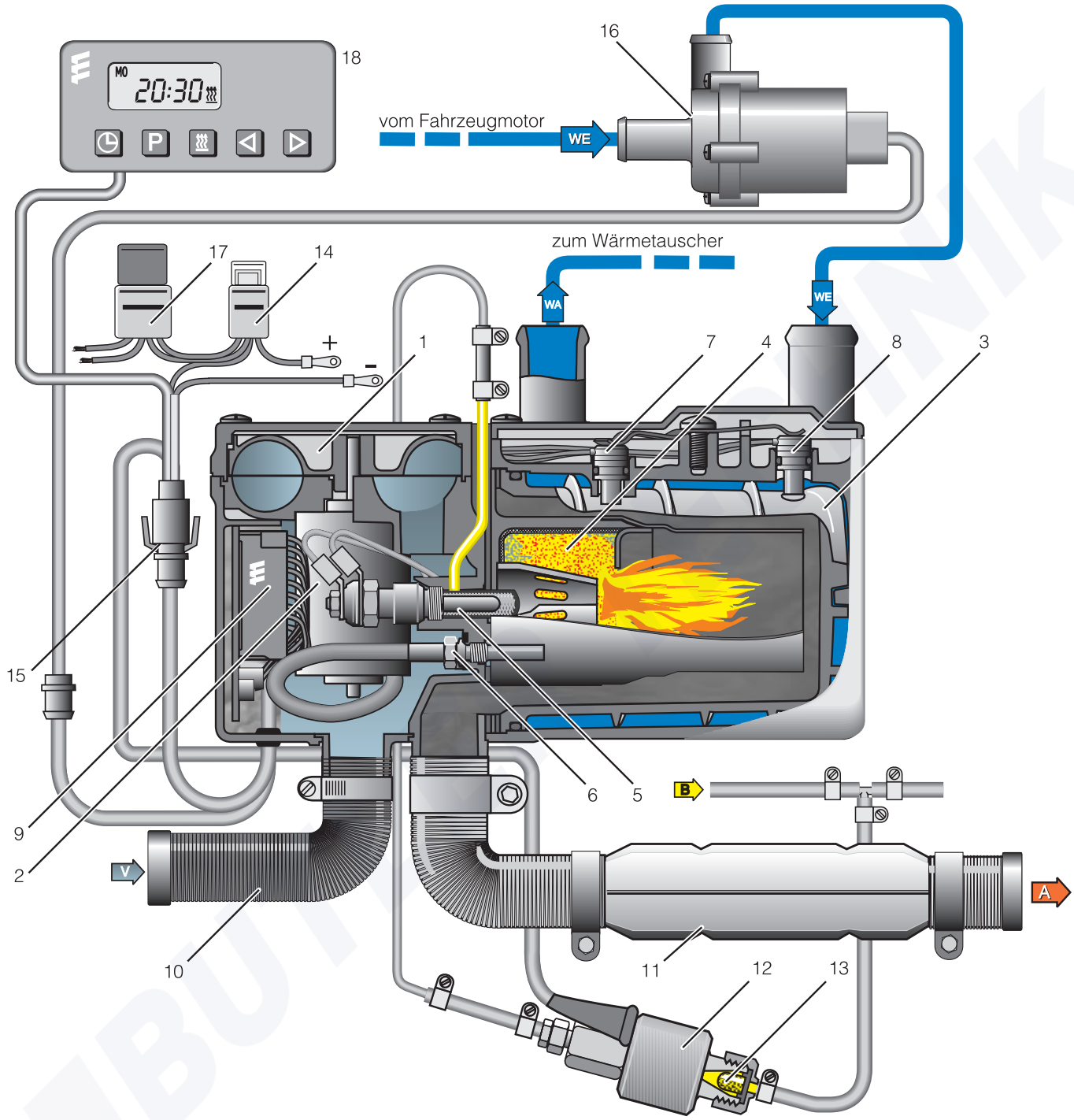
The flame is monitored by the flame sensor and the max. permissible temperature by the overheat sensor.
Both influence the control unit, which shuts down the *HYDRONIC* in the event of faults.

- If the *HYDRONIC* does not ignite within 90 seconds after the start of fuel feed, start-up is repeated.
  If the *HYDRONIC* does not ignite repeatedly within 90 seconds after the start of fuel feed, a fault shutdown takes place.
- If the flame goes out by itself while the heater is in operation, a restart is initially carried out.
  If the *HYDRONIC* does not ignite within 90 seconds after the start of fuel feed, or if it ignites but goes out again, a fault shutdown takes place.
  The fault shutdown can be cancelled by briefly switching the heater off and on again.
- In the event of an overheat (e.g. shortage of water, poorly ventilated coolant circulation system), the overheat sensor is tripped, fuel feed is shut off, then a fault shutdown is activated.
  Once the cause of the overheat has been eliminated, the *HYDRONIC* can be restarted by switching it off and on again (prerequisite: the *HYDRONIC* has cooled down sufficiently).
- If the voltage drops below approx. 10 Volts or 20 Volts or rises above 15 Volts or 30 Volts, a (delayed) fault shutdown is activated.
- If the glow plug is defective or an electrical lead running to the metering unit is broken, the *HYDRONIC* does not start.
- The blower motor speed is monitored continuously.
  If the blower motor does not start or becomes blocked, a fault shutdown is activated.

Please note!

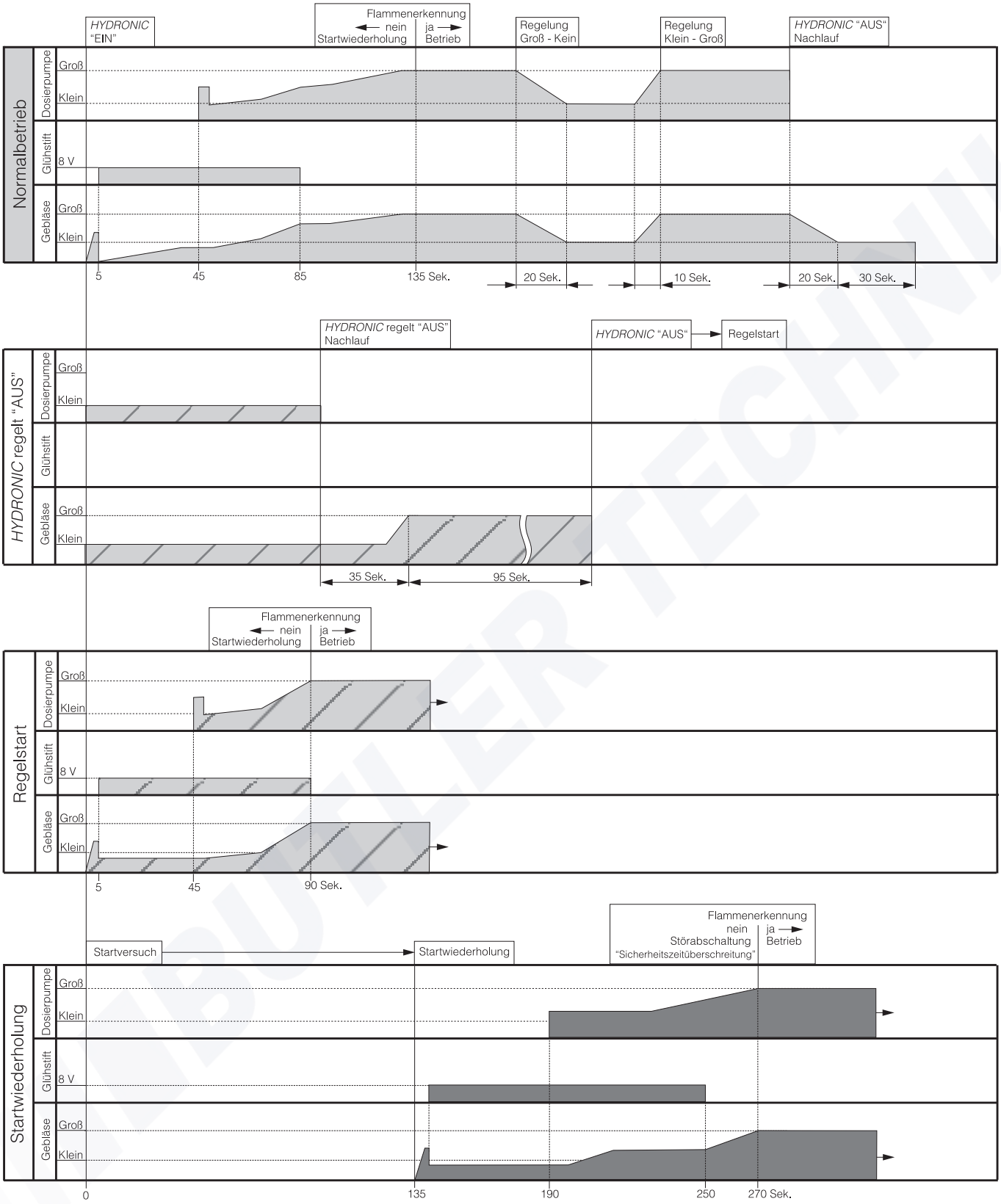
- The *HYDRONIC* must always be switched off when re-fuelling.
- The *HYDRONIC* must not be operated in garages.
- The coolant should contain at least 10% antifreeze all year round as protection against corrosion.
- When performing electric welding work on the vehicle, disconnect the plus terminal of the battery and connect to GND in order to protect the control unit.
- Also switch on the *HYDRONIC* briefly (for approx. 10 sec.) once a month outside the heating period in order to prevent the water pump and burner motor seizing up.
- Before switching on or pre-programming the heating mode, move the heating lever of the vehicle to the "WARM" (maximum) setting and the blower to the "slow setting" (low power consumption).
- Operating instructions for timers and switches are supplied with the operating elements.
- If it is necessary to use other switches as per usual in automotive engineering, they must have a minimum rating of 1 ampere.

Sectional diagram (heater shown: *HYDRONIC* B 5 W S)



1	Combustion air blower	10	Combustion air hose	A	=	Exhaust gas
2	Electric motor	11	Exhaust pipe with silencer			
3	Heat exchanger	12	Metering pump	B	=	Fuel
4	Combustion chamber	13	Strainer built into metering pump			
5	Glow plug	14	Main fuse	V	=	Combustion air
6	Flame sensor	15	Interface / 8-pin plug			
7	Temperature sensor	16	Water pump	WA	=	Water outlet
8	Overheat sensor	17	Relay, vehicle blower			
9	Control unit	18	Timer module	WE	=	Water inlet

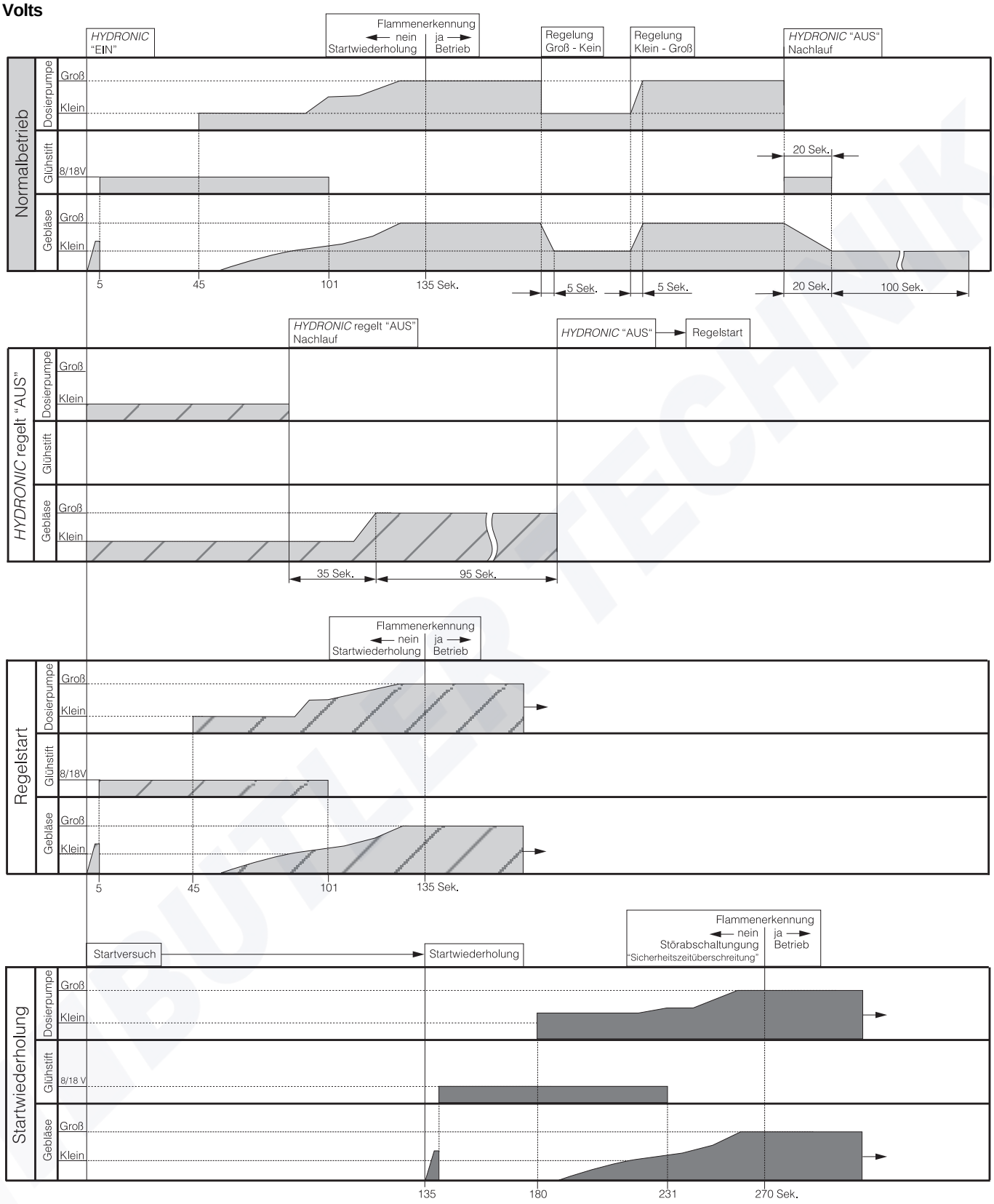
Functional diagram — *HYDRONIC* B 5 W S



Switching temperatures

High — Low	80 °C	Off — On	75 °C	Vehicle blower	
Low — Off	85 °C	Low — High	75 °C	On 30 °C / Off 20 °C	

Functional diagram — *HYDRONIC* D 5 W S — 12 Volts / 24 Volts



Switching temperatures

High — Low	80 °C	Off — On	75 °C	Vehicle blower	
Low — Off	85 °C	Low — High	75 °C	On 30 °C / Off 20 °C	

Specifications

	HYDRONIC B		*HYDRONIC*		
Test code	∿∿ S 288		∿∿ S 274		
Heating medium	Water, coolant				
Heating capacity control	High / Low				
Fuel	Gasoline (commercially available)		Diesel (commercially available)		
Rated voltage	12 Volts		12 Volts or 24 Volts		
Heating capacity	High	Low	High	Low	
	5000	1500	5000	2200	Watts
Fuel consumption	0,69	0,21	0,62	0,27	l / h
Electric power consumption (excl. wp) • at start-up • in High setting • in Low setting	< 100 37 10		at 12 Volts < 100 37 12	at 24 Volts < 100 37 12	 Watts Watts Watts
Operating range • Lower voltage limit An undervoltage safety device built into the control unit switches the heater off at approx. 15 Volts or 28 Volts	10		10	20	Volts
• Upper voltage limit An overvoltage safety device built into the control unit switches the heater off at approx. 15 Volts or 28 Volts	15		15	28	Volts
Permissible operating pressure	up to 2.5 bar overpressure				
Minimum water flow rate	300 l /h				
CO_2 value	10,5 % by vol. $^{+\ 1\ \%\ by\ vol.}_{-\ 2,5\ \%\ by\ vol.}$				
CO in exhaust gas	≤ 0,1 % by vol.				
Smoke spot number acc. to Bacharach	< 4				
Radio interference suppression leve	VHF 3 — SW 4 — MW / LW 5				
Ambient temperature • *HYDRONIC* in operation • Metering pump in operation • *HYDRONIC* and metering pump not in operation	-40 °C to + 80 °C -40 °C to + 20 °C -40 °C to +125 °C		-40 °C to + 80 °C -40 °C to + 80 °C -40 °C to +125 °C		
Weight incl. water pump and metering pump	approx. 2,9 kg				

Specifications — water pump
(the water pump cannot be activated externally)

Water flow rate against 0.1 bar	12 Volts = 800 l / h	24 Volts = 900 l / h
Electric power consumption	12 Volts = 16 Watts	24 Volts = 12 Watts

These specifications include the tolerance of +10 % of rated voltage standard for heaters unless otherwise specified.

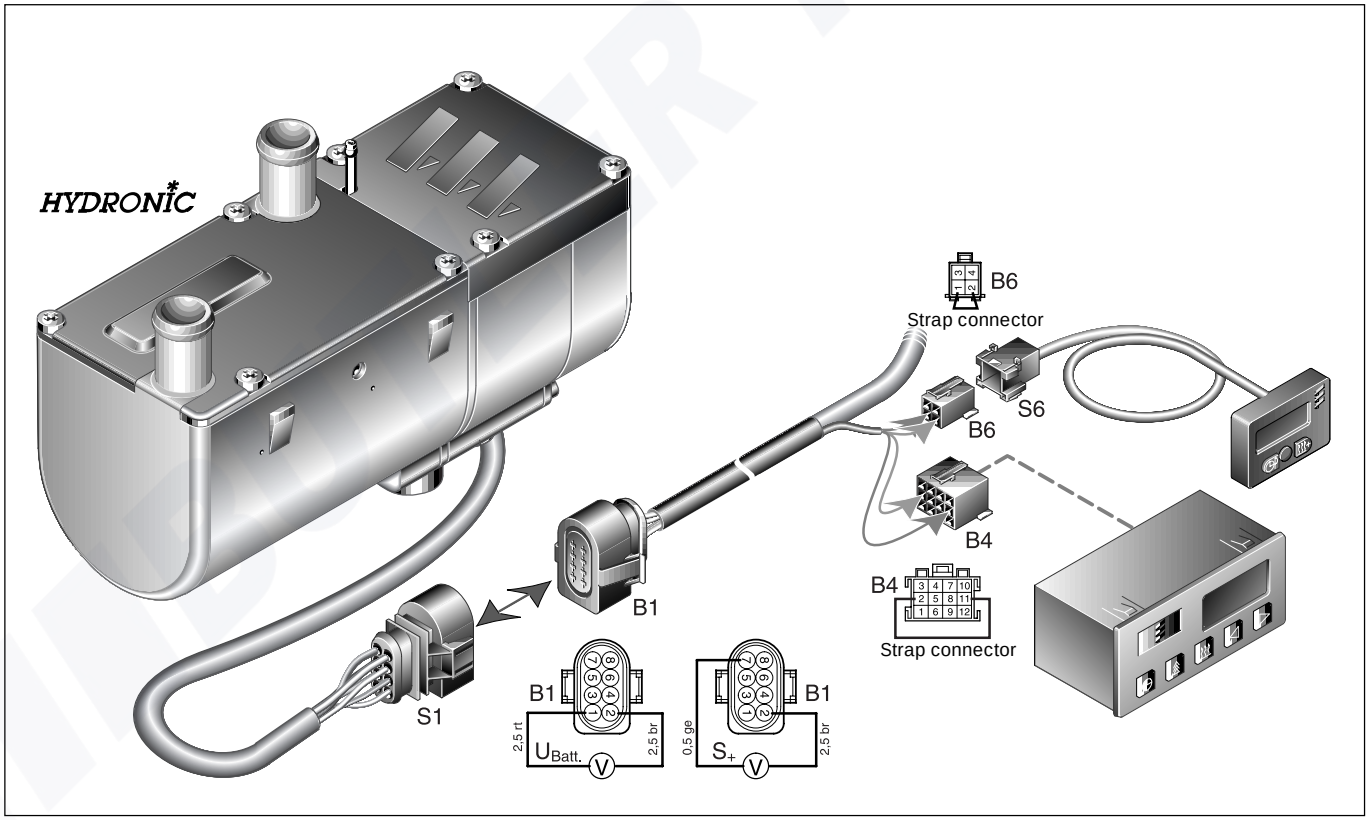
First check for the following if faults occur

- Check the fuel level.
- Mechanical damage of components.
- When making transition to winter operation: Is there still summer diesel in the fuel line?
- Check the exhaust and combustion air pipes.
- Check fuses.

- **Check voltage supply V_{bat} (terminal 30)**
  Disconnect the 8-pin plug S1/B1 and measure the voltage applied to plug B1 between terminal jack 1 (red (rt) 2.5 mm² wire) and terminal jack 2 (brown (br) 2.5 mm² wire).
  In case of deviation of the battery voltage, check the fuses, supply leads, GND connection and the positive terminal on the battery for voltage drop (corrosion, open circuit).

- **Check switch-on signal (S+)**
  Disconnect the 8-pin plug S1/B1 and then press the key on the operating element. Measure the voltage applied to plug B1 between terminal jack 7 (yellow (ge) 0.5 mm² wire) and terminal jack 2 (brown (br) 2.5 mm² wire).
  If no voltage is applied, check the supply lead (yellow (ge) 0.5 mm² wire), the 5A fuse (item 2.7.1 in wiring diagram on pp. 24 and 25) and the operating element.

- **Check operating element (timer module/"Mini" timer)**
  Disconnect the plug from the operating element and bridge the red (rt) 0.5 mm² wire and the yellow (ge) 0.5 mm² wire.
  If no voltage is applied to plug B1 between terminal jack 7 (yellow (ge) 0.5 mm² wire) and terminal jack 2 (brown (br) 2.5 mm² wire), replace the operating element.



Please note!
To carry out additional troubleshooting, the timer module or the diagnostic unit with adapter cable is required to interrogate the fault memory in the control unit and, if need be, to cancel the control unit interlock.
See pages 8 and 9 for Cat. No. and operation.

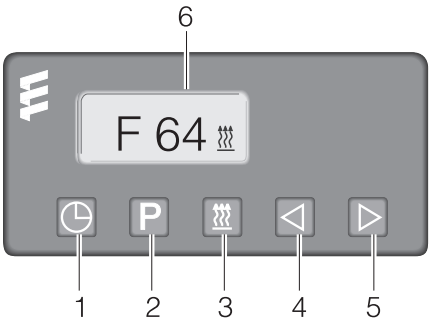
Fault diagnosis with timer module

Timer module display (D) Cat. No. 22 1000 30 34 00
Timer module display (GB) Cat. No. 22 1000 30 36 00

If the control unit detects a fault when the *HYDRONIC* is switched on or while the *HYDRONIC* is in operation, the timer module indicates this using an error code comprising the letter F and as a 2-figure number within 15 sec.

Readout on display, e.g. **F64** (current fault)
+ flashing heating symbol

Fault codes, fault descriptions, remarks/remedial action are described on pages 10 to 14.



1 Time
2 Preselect
3 Heat
4 Back
5 Forward
6 Display

Interrogating the fault memory in the control unit using the timer module

The electronic control unit can store up to 5 faults which can be read out and displayed with the timer module.
The current fault is always written to memory location F1.
Preceding faults are transferred to memory locations F2 — F5.
The content of memory location F5 is overwritten if necessary.

Interrogating the fault memory

Condition: The *HYDRONIC* is switched off.

Press the [heat] — the heater is switched on — then press the [clock], hold it down and then press the [P] key within 2 seconds. The heating symbol flashes and the current error is indicated.

The errors stored in memory locations F1 to F5 can be called up using the [◁] and [▷] keys.

Fault codes, fault descriptions, remarks/remedial action are described on pages 10 to 14.

Please note!

Not only a faulty component but also a faulty current path leads to a fault message being displayed.

See page 14 for faults which the diagnostic system does not indicate.

If the heater is not operated in combination with the timer module, fault diagnosis can be performed using the diagnostic unit (see page 9).

Reasons for interlocking of control unit

- Overheat
  If the *HYDRONIC* overheats 10 times in succession — fault 012 — fault message F15 is displayed, i.e. the control unit is interlocked.
- Too many failed starts
  If the *HYDRONIC* performs 10 unsuccessful attempts in succession — fault 050 — fault message F50 is displayed, i.e. the control unit is interlocked.

Cancelling the control unit interlock by erasing the fault memory

Condition: The electrical connection between the 12-pin plug (terminal jack 10 of the timer module) and terminal 15 (ignition) is in place.

Press key [heat] — the current fault (F15 or F50) is displayed — then press
the [clock] key, hold it down and press the [P] key within 2 seconds.
The timer module is now in the “Interrogate fault memory” program.
Now, proceed as follows:
Turn off the ignition (terminal 15).
Press keys [clock] and [P] simultaneously and hold them down, turn on the ignition (terminal 15) and wait until the following message appears on the display.

Message displayed after turning ignition “ON”

Display flashing, heating symbol not flashing

The control unit interlock is cancelled after 3 seconds, after which the heater starts up.

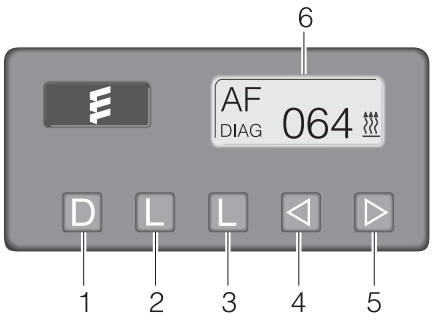
Message displayed after heater has started

Display flashing
heating symbol not flashing

Fault diagnosis using the diagnostic unit

Diagnostic unit Cat. No. 22 1512 89 00 00

Please note!
An adapter cable — Cat. No. 22 1000 30 71 00 — is required to connect the diagnostic unit to the wiring harness of the *HYDRONIC*.



1 Diagnosis — call up fault code
2 Erase stored fault
3 Erase stored fault
4 Back, faults F5 — F1
5 Forward, faults F1 — F5
6 Display

Connecting the diagnostic unit

Lay the wiring from the diagnostic unit to the wiring harness as shown in the diagram and connect.
Connect the 8-pin plug to the diagnostic unit and switch on the *HYDRONIC* with the operating device.

Interrogating the fault memory with the diagnostic unit

The electronic control unit can store up to 5 faults which can be read out and displayed with the diagnostic unit.
The current fault is always indicated as "AF" written to memory location F1.
Preceding faults are transferred to memory locations F2 — F5.
The content of memory location F5 is overwritten if necessary.

Interrogating the fault memory

Press key D, and the fault will be displayed:
AF = Current fault
3-figure number = Fault code

Fault codes, fault descriptions, remarks/remedial action are described on pages 10 to 14.

Reasons for interlocking of control unit

- Overheat
  If the *HYDRONIC* overheats 10 times in succession — fault 012 — fault message AF 015 is displayed, i.e. the control unit is interlocked.
- Too many failed starts
  If the *HYDRONIC* performs 10 unsuccessful attempts in succession — fault 050 — fault message AF 050 is displayed, i.e. the control unit is interlocked.

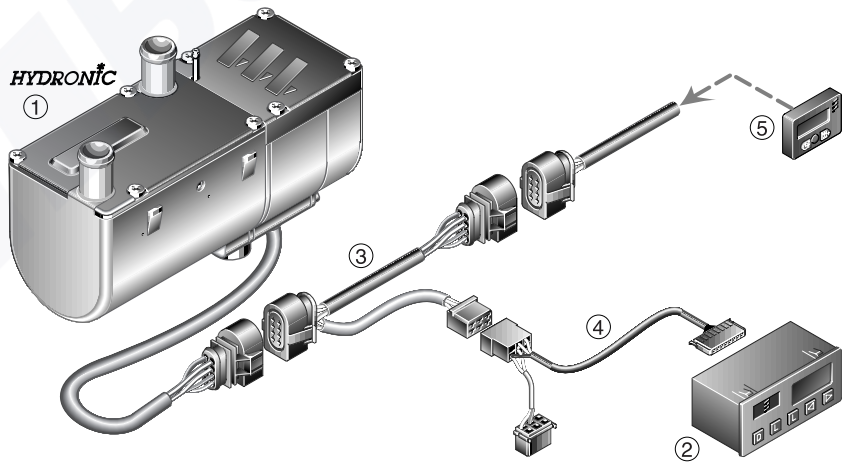
Cancelling the control unit interlock by erasing the fault memory

After eliminating the cause of the fault, press the two keys L simultaneously for at least 2 seconds.
The control unit interlock is now released and stored faults F1 to F5 are erased.
Switch the *HYDRONIC* off and on again.

Please note!

Not only a faulty component but also a faulty current path leads to a fault message being displayed.

See page 14 for faults which the diagnostic system does not indicate.



1 *HYDRONIC*
2 Diagnostic unit
3 Adapter cable
4 Cable harness — diagnostic unit
5 Mini timer

Fault code Fault description		Remarks • Remedial action
010	Overvoltage cut-out	Overvoltage is continuously applied to control unit for at least 20 seconds à *HYDRONIC* is not operational • Disconnect connector B1/S1, start the vehicle engine and measure the voltage applied to plug B1 between terminal jack 1 (red (rt) 2.5 mm² wire) and terminal jack 2 (brown (br) 2.5 mm² wire). If the voltage is > 15 Volts or > 28 Volts, check the alternator controller or the battery.
011	Undervoltage cut-out	Undervoltage is continuously applied to control unit for at least 20 seconds —> *HYDRONIC* is not operational • Disconnect connector B1/S1, switch off the vehicle engine, and measure the voltage applied to plug B1 between terminal jack 1 (red (rt) 2.5 mm² wire) and terminal jack 2 (brown (br) 2.5 mm² wire). If the voltage is < 10 Volts or < 20 Volts, check the fuses, the supply leads, the GND connections and the positive terminal on the battery for voltage drop (corrosion). • Is sufficient voltage present during the engine start-up procedure?
012	Overheat (software threshold value)	Temperature at overheat sensor >125°C • Check water circulation system: - check all hose connections for leaks - is a restrictor fitted in the water circulation system? - was attention paid to the correct direction of flow during installation of thermostat and check valve? - has the water circulation system been bled carefully? - check water pump for function • Check temperature sensor and overheat sensor and replace if necessary. See page 22 for reference values.
014	Possible overheat detected (difference evaluation) **Please note!** The *HYDRONIC* with date of manufacture up to 12.97 has the following values: Difference between temperature values of overheat sensor and temperature sensor > 15K. Water temperature at overheat sensor min. 70°C	Difference between temperature values of overheat sensor and temperature sensor > 25K. The prerequisite for this fault code being indicated is that the *HYDRONIC* is in operation and that the water temperature at the overheat sensor is at least 80°C. • Check water circulation system: - check all hose connections for leaks - is a restrictor fitted in the water circulation system? - was attention paid to the correct direction of flow during installation of thermostat and check valve? - has the water circulation system been bled carefully? - check water pump for function • Check temperature sensor and overheat sensor and replace if necessary. See page 22 for reference values.
015	Equipment disabled — max. permissible number of 10 possible overheats exceeded	The control unit is interlocked. • Release the control unit interlock by erasing the fault memory with the timer module or the diagnostic unit (see pages 8 and 9). • Check the water circulation system: - check all hose connections for leaks - is a restrictor fitted in the water circulation system? - was attention paid to the correct direction of flow during installation of thermostat and check valve? - has the water circulation system been bled carefully? - check water pump for function

Fault code Fault description	Remarks • Remedial action
017 Overheat detected — EMERGENCY STOP (hardware threshold value)	Temperature at overheat sensor >130°C • Check water circulation system: - check all hose connections for leaks - is a restrictor fitted in the water circulation system? - was attention paid to the correct direction of flow during installation of thermostat and check valve? - has the water circulation system been bled carefully? - check water pump for function • Check temperature sensor and overheat sensor and replace if necessary. See page 22 for reference values.
020 Glow plug interruption 021 Short-circuit, overload or ground fault at glow plug output **Important!** In the case of the *HYDRONIC* — 12 Volts, carry out functional check using max. 8 Volts. In the case of the *HYDRONIC* — 24 Volts, carry out functional check using max. 18 Volts. Exceeding the prescribed voltages will result in irreparable damage to the glow plug. **Pay attention to the short-circuit-proofing of the power supply unit.**	• Carry out a functional check on the glow plug as fitted. For this purpose, unclip the 1.5² white (ws) wire from terminal jack 9 and the 1.5² brown (br) wire out of terminal jack 12 of the 14-pin plug. Apply a voltage of 8 Volts or 18 Volts ±0.1 Volts to the glow plug and measure the current intensity after 25 seconds. The glow plug is OK if the following values are measured. If this is not the case, replace the glow plug. 8 Volt glow plug — current intensity = 8.5A $^{+1\,A}_{-1,5\,A}$ 18 Volt glow plug — current intensity = 4.5A ± 1.5A • If the glow plug is OK, check the cable harness from the glow plug for damage and continuity. • If fault code 021 is displayed, also check glow plug for assembly of the connection piece and the corrugated washer. Check cable harness for short circuit.
030 Speed of combustion air blower motor outside permissible range **Important!** In the case of the *HYDRONIC* — 12 Volts, carry out functional check using max. 8.2 Volts + 0.2 Volts. In the case of the *HYDRONIC* — 24 Volts, carry out functional check using max. 15 Volts + 0.2 Volts. Check the positive/negative lines for proper connection. **Pay attention to the short-circuit-proofing of the power supply unit.**	Blower wheel or combustion air blower motor blocked (frozen up, soiled, sluggish, cable harness rubbing against end of shaft, etc.) • Clear blockage • Measure speed of combustion air blower motor using max. 8.2 Volts + 0.2 Volts or 15 Volts + 0.2 Volts. For this purpose, unclip the 0.75² brown (br) wire from terminal jack 14 and the 0.75² black (bk) wire out of terminal jack 13 of the 14-pin plug. Attach a marking on the end of the combustion air blower motor shaft and measure the speed with a contactless tachometer (see page 21). If measured speed < 10,000 rpm, replace the combustion air blower. If measured speed > 10,000 rpm, replace the control unit.
031 Open circuit in combustion air blower motor **Important!** In the case of the *HYDRONIC* — 12 Volts, carry out functional check using max. 8.2 Volts + 0.2 Volts. In the case of the *HYDRONIC* — 24 Volts, carry out functional check using max. 15 Volts + 0.2 Volts. Check the positive/negative lines for proper connection. **Pay attention to the short-circuit-proofing of the power supply unit.**	• Check to see if the combustion air blower motor wiring is laid properly or damaged. • Measure speed of combustion air blower motor using max. 8.2 Volts + 0.2 Volts or 15 Volts + 0.2 Volts. For this purpose, unclip the 0.75² brown (br) wire from terminal jack 14 and the 0.75² black (bk) wire out of terminal jack 13 of the 14-pin plug. Attach a marking on the end of the combustion air blower motor shaft and measure the speed with a contactless tachometer (see page 21). If measured speed < 10,000 rpm, replace the combustion air blower. If measured speed > 10,000 rpm, replace the control unit.

Fault code Fault description	Remarks • Remedial action
032 Short circuit, overload or ground fault of combustion air blower motor **Important!** In the case of the *HYDRONIC* — 12 Volts, carry out functional check using max. 8.2 Volts + 0.2 Volts. In the case of the *HYDRONIC* — 24 Volts, carry out functional check using max. 15 Volts + 0.2 Volts. Check the positive/negative lines for proper connection. **Pay attention to the short-circuit-proofing of the power supply unit.**	Blower wheel or combustion air blower motor blocked (frozen up, soiled, sluggish, cable harness rubbing against end of shaft, etc.) • Clear blockage • Before proceeding with the functional check on the combustion air blower motor, perform a resistance measurement. If measured resistance is < 2 kΩ, then a ground fault has occurred — replace the combustion air blower. If measured resistance is > 2 kΩ, then a ground fault can be ruled out — measure the speed of the combustion air blower. • Measure speed of combustion air blower motor using max. 8.2 Volts + 0.2 Volts or 15 Volts + 0.2 Volts. For this purpose, unclip the 0.75² brown (br) wire from terminal jack 14 and the 0.75² black (bk) wire out of terminal jack 13 of the 14-pin plug. Attach a marking on the end of the combustion air blower motor shaft and measure the speed with a contactless tachometer (see page 21). If measured speed < 10,000 rpm, replace the combustion air blower. If measured speed > 10,000 rpm, replace the control unit.
038 Open circuit in vehicle blower relay control	• Check electrical lead routed to relay Rectify open circuit. Replace relay if necessary.
039 Short circuit, overload or ground fault in vehicle blower relay control	• Disconnect relay. If fault code 038 is displayed, then the relay is defective — replace relay.
041 Open circuit in water pump	• Check supply lead to water pump for continuity. For this purpose, unclip the 0.5² brown (br) wire from terminal jack 10 and the 0.5² violet (vi) wire out of terminal jack 11 of the 14-pin plug. Rectify open circuit. Replace relay if necessary.
042 Short circuit, overload or ground fault in water pump	• Disconnect connector in the “water pump” line. If fault code 041 is displayed, then the water pump is defective — replace water pump.
047 Short circuit, overload or ground fault in metering pump	• Disconnect connector in the “metering pump” line. If fault code 048 is displayed, then the metering pump is defective — replace metering pump.
048 Open circuit in metering pump	• Check cable harness of metering pump for continuity. Clear open circuit. Replace metering pump if necessary.
050 Equipment has been disabled due to too many failed starts (10 start attempts plus repeat start-up for each start attempt)	Max. permissible number of safety time counters exceeded; the control unit is interlocked. • Release the control unit interlock by erasing the fault memory with the timer module or diagnostic unit. • Check fuel quantity and fuel supply (see page 26).
051 Time overshoot — cold air blowing	At start-up, the flame sensor indicates a temperature of >70°C for longer than 240 sec. • Check exhaust gas and combustion air piping. • Check flame sensor — see page 20 for reference values.

Fault code Fault description		Remarks • Remedial action
052	Safety time exceeded	The max. permissible number of start attempts has been used up. • Check exhaust gas and combustion air piping. • Check the fuel quantity and fuel supply (see page 26). • In the case of the *HYDRONIC* B 5 W S, clean, and if necessary replace, the strainer in the connection.
053 056	Flame loss in "High" setting Flame loss in "LOW" setting	**Attention!** In the event of flame loss in the "High" or "Low" settings and if start attempts are still permitted, the *HYDRONIC* performs a restart followed by repeat start-up if necessary. If the restart of repeat start-up was successful, the indicated fault code is cleared. **Fault** (because a new start attempt is no longer permissible) • Check exhaust gas and combustion air piping. • Check the fuel quantity and fuel supply (see page 26). • Check flame sensor — see fault codes 064 and 065.
060	Open circuit in temperature sensor **Please note!** The test can only be performed with a jumper strap fitted in the 14-pin plug if the *HYDRONIC* is still installed in the vehicle or if a test bench is available.	• Remove the control unit and check the connecting cable of the temperature sensor from damage. If the cable harness is OK, then short the temperature sensor — route wire in 14-pin plug from terminal jack 3 to terminal jack 4. Switch on the *HYDRONIC*. - if fault code 061 is displayed, remove and check the temperature sensor (see page 22). - if fault code 060 is displayed, check the control unit and replace if necessary.
061	Short circuit, overload or ground fault in temperature sensor **Please note!** The test can only be performed with a jumper strap fitted in the 14-pin plug if the *HYDRONIC* is still installed in the vehicle or if a test bench is available.	• Remove the control unit and check the connecting cable of the temperature sensor from damage. If the cable harness is OK, then disconnect the 14-pin plug from the control unit and unclip the 0.5 mm² blue (bl) wire from terminal jack 3 and the 0.5 mm² blue (bl) wire from terminal jack 4. Plug the 14-pin plug into the control unit and switch on the *HYDRONIC* - if fault code 060 is displayed, remove and check the temperature sensor (see page 22). - if fault code 061 is displayed, check the control unit and replace if necessary.
064	Open circuit in flame sensor **Please note!** The test can only be performed with a jumper strap fitted in the 14-pin plug if the *HYDRONIC* is still installed in the vehicle or if a test bench is available.	• Remove the control unit and check the connecting cable of the flame sensor from damage. If the cable harness is OK, then short the flame sensor — route wire in 14-pin plug from terminal jack 1 to terminal jack 2. Switch on the *HYDRONIC* - if fault code 065 is displayed, remove and check the flame sensor (see page 20). - if fault code 064 is displayed, check the control unit and replace if necessary.

Fault code Fault description	Remarks • Remedial action
065 Short circuit, overload or ground fault in flame sensor **Please note!** The test can only be performed if the *HYDRONIC* is still installed in the vehicle or if a test bench is available.	• Remove the control unit and check the connecting cable of the flame sensor from damage. If the cable harness is OK, then disconnect the 14-pin plug from the control unit and unclip the 0.5 mm² blue (bl) wire from terminal jack 1 and the 0.5 mm² brown (br) wire from terminal jack 2. Plug the 14-pin plug into the control unit and switch on the *HYDRONIC* - if fault code 064 is displayed, remove and check the flame sensor (see page 20). - if fault code 065 is displayed, check the control unit and replace if necessary.
071 Open circuit in overheat sensor **Please note!** The test can only be performed if the *HYDRONIC* is still installed in the vehicle or if a test bench is available.	• Remove the control unit and check the connecting cable of the overheat sensor from damage. If the cable harness is OK, then short the overheat sensor — route wire in 14-pin plug from terminal jack 5 to terminal jack 6. Switch on the *HYDRONIC*. - if fault code 072 is displayed, remove and check the overheat sensor (see page 22). - if fault code 071 is displayed, check the control unit and replace if necessary.
072 Short circuit, overload or ground fault in overheat sensor **Please note!** The test can only be performed if the *HYDRONIC* is still installed in the vehicle or if a test bench is available.	• Remove the control unit and check the connecting cable of the overheat sensor from damage. If the cable harness is OK, then disconnect the 14-pin plug from the control unit and unclip the 0.5 mm² red (rt) wire from terminal jack 5 and the 0.5 mm² red (rt) wire from terminal jack 6. Plug the 14-pin plug into the control unit and switch on the *HYDRONIC* - if fault code 071 is displayed, remove and check the overheat sensor (see page 22). - if fault code 072 is displayed, check the control unit and replace if necessary.
090 / 092 — 103 Control unit defective	Replace control unit
091 External interference voltage	Fault in control unit caused by interference voltages radiating from vehicle electrical system. Possible causes: Poor-quality battery, chargers, other sources of interference —> Eliminate interference voltages.

Faults which the diagnostic system does not indicate

Fault description	Remarks • Remedial action
HYDRONIC does not start	The water pump and the vehicle blower start as soon as the *HYDRONIC* is switched on. • Remove temperature sensor and check (see page 22). The vehicle blower starts after the *HYDRONIC* is switched on — "stationary ventilation" function is activated. • Set "stationary ventilation" switch to "OFF" position.

Repair Instructions Page

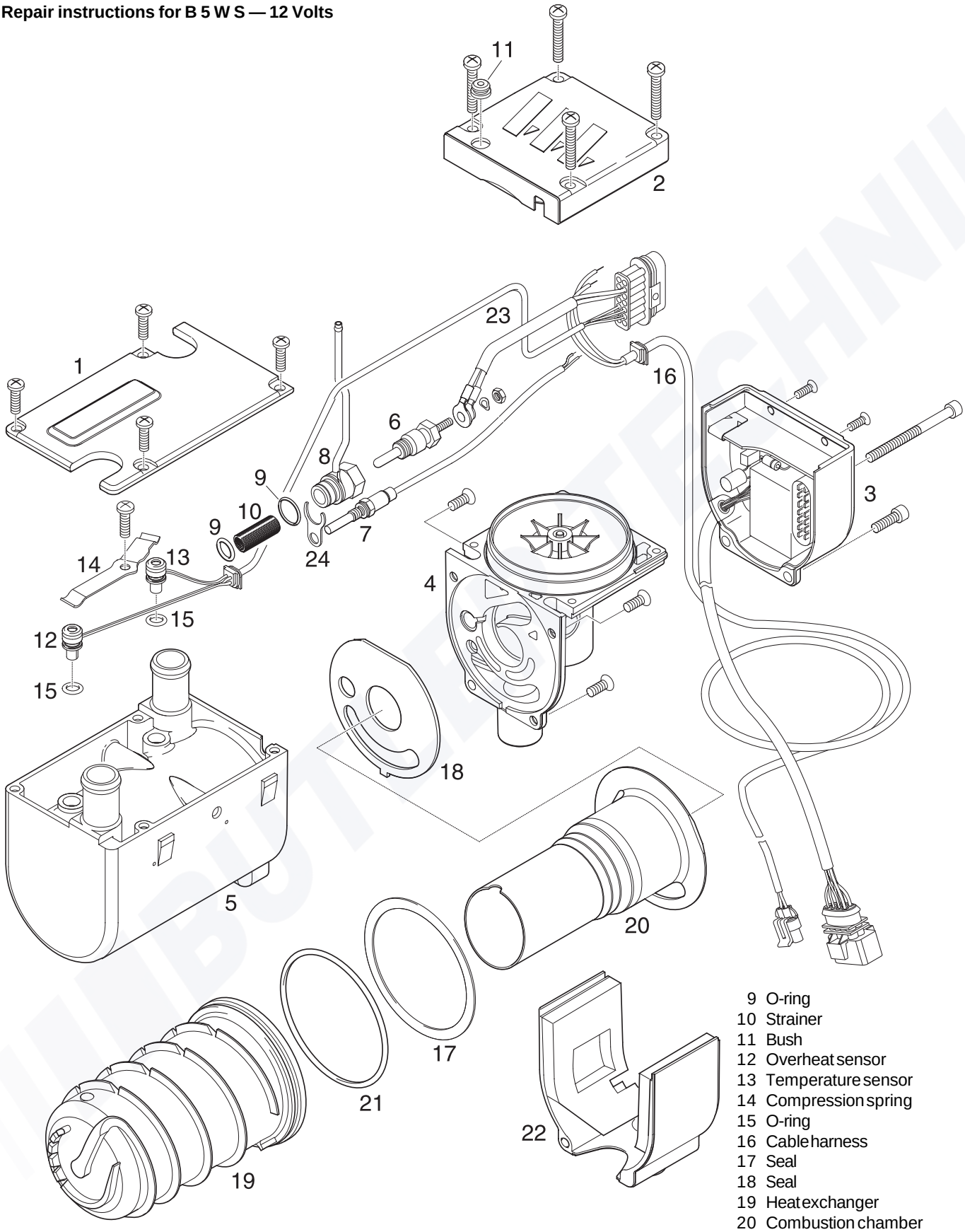
Page

Please note the following during installation!

Carefully check all seals and O-rings. Renew if necessary.

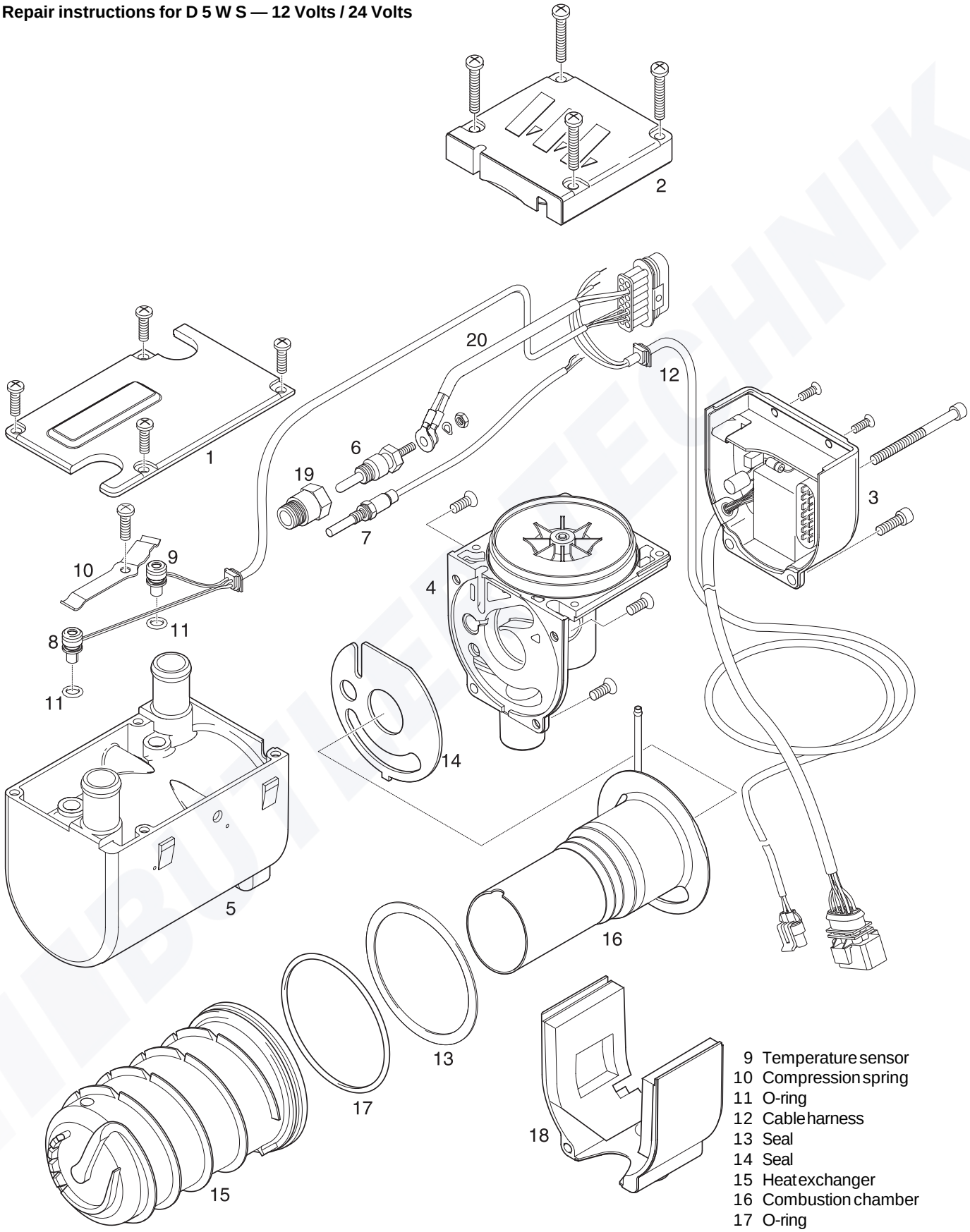
All parts must be cleaned and checked for damage prior to assembly. Renew if necessary.

Note:
The Repair Instructions describe how to repair the *HYDRONIC* in the dismantled state.



Sketch 1

1 Cover — jacket
2 Cover — combustion air blower
3 Control unit
4 Combustion air blower
5 Water cooling jacket
6 Glow plug
7 Flame sensor
8 Connection
9 O-ring
10 Strainer
11 Bush
12 Overheat sensor
13 Temperature sensor
14 Compression spring
15 O-ring
16 Cable harness
17 Seal
18 Seal
19 Heat exchanger
20 Combustion chamber
21 O-ring
22 Engine cover
23 Cable harness — glow plug
24 Support



Sketch 2

1 Cover — jacket
2 Cover — combustion air blower
3 Control unit
4 Combustion air blower
5 Water cooling jacket
6 Glow plug
7 Flame sensor
8 Overheat sensor
9 Temperature sensor
10 Compression spring
11 O-ring
12 Cable harness
13 Seal
14 Seal
15 Heat exchanger
16 Combustion chamber
17 O-ring
18 Engine cover
19 Adapter piece (for 24 Volts version only)
20 Cable harness — glow plug

Removing control unit (see Fig. 1)

Detach the 4 fastening screws from the blower cover and then remove the 4 fastening screws from the control unit.
Lift up the control unit and detach the engine cover, taking care to avoid damaging the lining.
Remove the control unit and disconnect the 14-pin plug.

For assembly, first of all connect the 14-pin plug to the control unit.
Attach the engine cover to the combustion air blower, taking care to avoid damaging the lining.
Insert the bush of the "water pump" cable harness into the cut-out in the combustion air blower. Lay all electrical leads between the electric motor and housing and then insert the control unit into the guide slot of the combustion air blower.
Insert and tighten the fastening bolts of the blower cover and control unit.

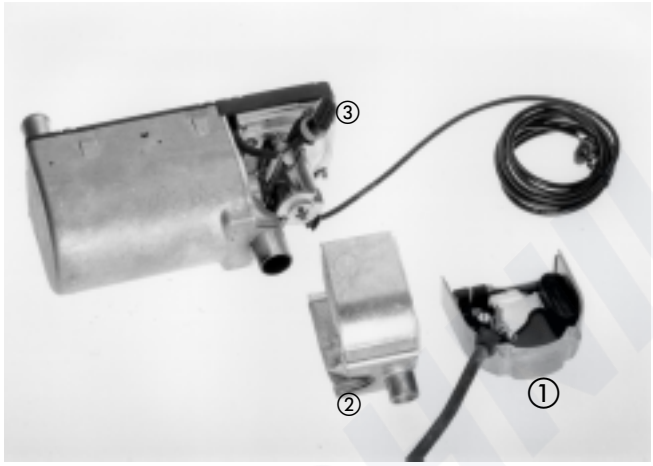


Fig. 1

① Control unit
② Engine cover with lining
③ 14-pin plug

Checking control unit

A basic tester and a control unit adapter are required for checking the control unit. The control unit adapter makes the electrical connection between the control unit and the basic tester.

The basic tester is connected to the PC, and the control unit can be tested by means of an installed test program.

Cat. No. — Basic tester	22 1508 89 00 00
Cat. No. — Control unit adapter	22 1521 89 00 00

Removing the glow plug from the *HYDRONIC* D 5 W S (see Fig. 2)

- Remove control unit

Unscrew the M4 nut from the glow plug and remove the cable harness.
Unscrew the glow plug from the housing.

Please note!
In the case of the *HYDRONIC* D 5 W S — 24 Volts, unscrew the adapter piece from the glow plug and fit onto the new glow plug.

Removing cable harness of glow plug
Using a release tool made by AMP (Cat. No. 726519), unclip the 1.5² white (ws) wire from terminal jack 9 and the 1.5² brown (br) wire from terminal jack 12 of the 14-pin plug.
For installation, lay the cable harness between the electric motor and housing.

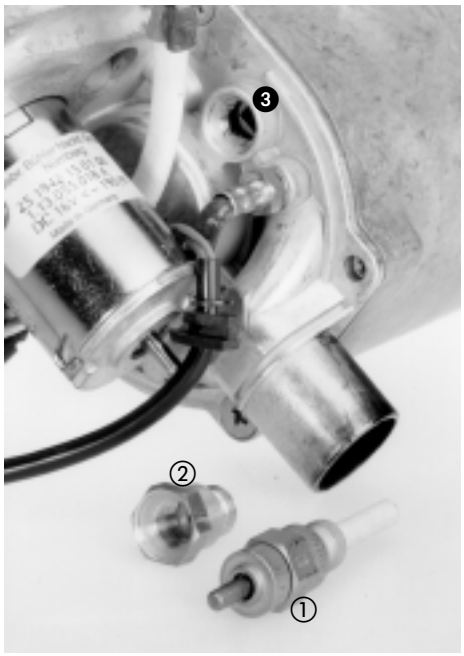


Fig. 2

① Glow plug
② Adapter piece for glow plug
(for *HYDRONIC* D 5 W S — 24 Volts only)
③ Glow plug — insert here

Removing glow plug of *HYDRONIC* B 5 W S (see Fig. 3)

• Remove control unit
Unscrew the M4 nut from the glow plug and remove the cable harness.
Unscrew the glow plug from the connection.

Removing cable harness of glow plug
Using a release tool made by AMP (Cat. No. 726519), unclip the 1.5² white (ws) wire from terminal jack 9 and the 1.5² brown (br) wire from terminal jack 12 of the 14-pin plug.
For installation, lay the cable harness between the electric motor and housing.

① Glow plug
② Glow plug — insert here
③ Flame sensor -with support

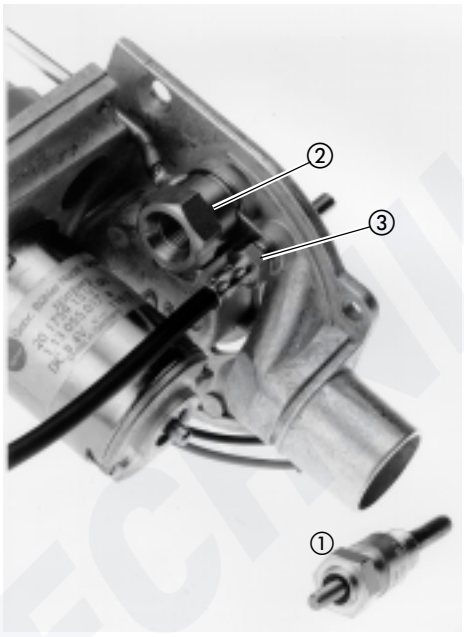


Fig. 3

Removing strainer and connection from *HYDRONIC* B 5 W S (see Fig. 4 and sketch 3)

Removing strainer
• Remove control unit
• Take out combustion air blower
• Remove glow plug
Remove O-ring and pull the strainer out of the connection using round nose pliers.
Check strainer and O-ring. Renew if necessary.

Removing connection
• Remove flame sensor together with the support.
Press the connection out of the housing and then swivel the fuel pipe outwards.
Clean the connection and check the O-ring. Renew if necessary.

Fitting connection and strainer
Insert connection into locating hole.
Swivel the fuel pipe into the initial position and then press the connection into the locating hole.
Insert the support into the slot, and then feed the flame sensor through the hole in the support and insert it into the tapped hole in the housing and screw securely.
Press the strainer into the connection until fully home.
Fit the O-ring on the strainer and insert it into the housing.

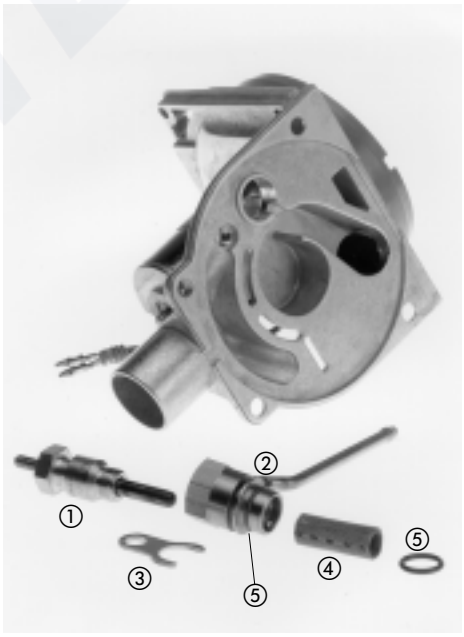
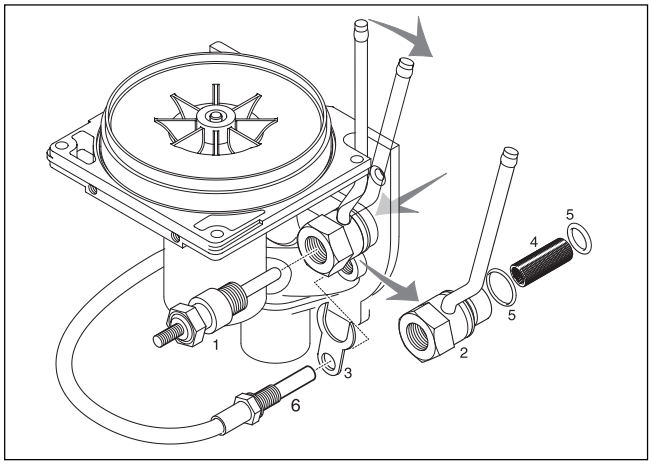


Fig. 4

Please note!
The welding spots of the strainer must face downwards.
Carefully check the O-rings prior to installation. Renew if necessary.

① Glow plug
② Connection
③ Support
④ Strainer
⑤ O-ring
⑥ Flame sensor



Sketch 3

Removing flame sensor (see Fig. 5)

• Remove control unit
Using a release tool made by AMP (Cat. No. 726534-1), unclip the 1.5² blue (bl) wire from terminal jack 1 and the 0.5² brown (br) wire from terminal jack 2 of the 14-pin plug.
Unscrew flame sensor from housing.
Check flame sensor. Replace if necessary.
For installation, lay the cable harness of the flame sensor between the electric motor and housing.

① Flame sensor
② Flame sensor — insert here

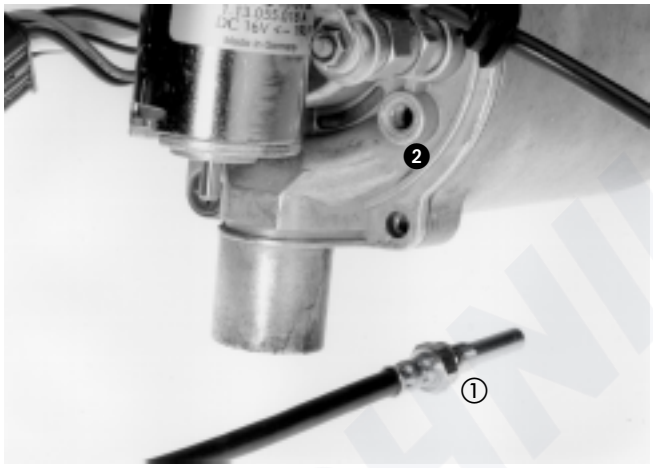
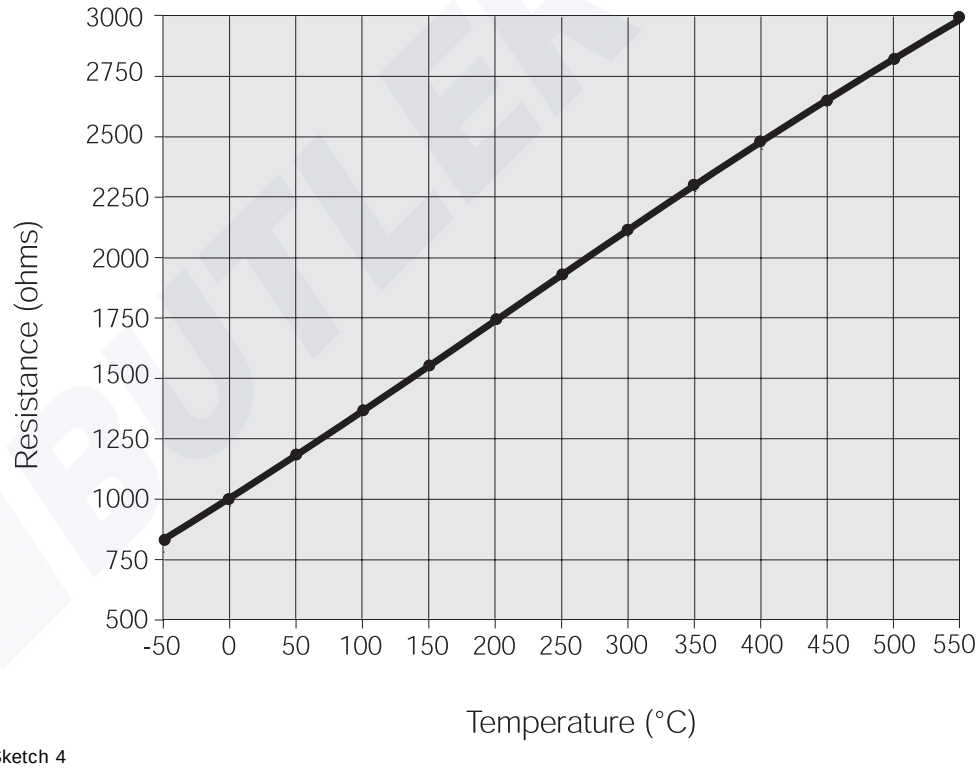


Fig. 5

Checking the flame sensor (see sketch 4)

Check the flame sensor using the Digital Multimeter. If the resistance value of the flame sensor lies **outside** the table of values or the diagram, then replace the flame sensor.



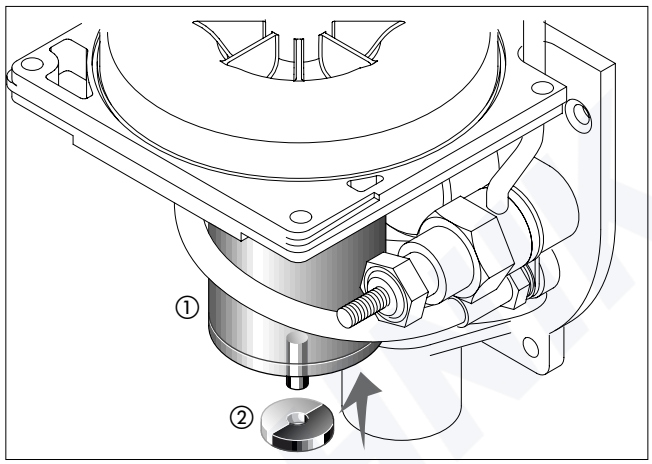
Sketch 4

Table of values

Temp. [°C]	-50	0	10	20	30	50	80	90	100	130	150	200	250	300	350	400
R [Ω]	803	1000	1022	1062	1097	1194	1309	1347	1385	1498	1573	1758	1941	2120	2297	2470
Vref [V]	1,407	1,639	1,661	1,719	1,738	1,840	1,948	1,983	2,016	2,111	2,171	2,308	2,432	2,542	2,642	2,732

Measuring speed of combustion air blower motor
(see sketch 5)

Measure speed of combustion air blower motor using max. 8.2 Volts + 0.2 Volts or 15 Volts + 0.2 Volts. For this purpose, unclip the 0.75² brown (br) wire from terminal jack 14 and the 0.75² black (bk) wire out of terminal jack 13 of the 14-pin plug. Attach a marking on the end of the combustion air blower motor shaft (for instance a black-and-white disk) and measure the speed with a contactless tachometer.
If measured speed < 10,000 rpm, replace the combustion air blower.
If measured speed > 10,000 rpm, replace the control unit.



Sketch 5

① Electric motor
② Black-and-white plastic disk

Removing the combustion air blower (see Fig. 6)

- Remove control unit
- Remove flame sensor
- Remove glow plug

Using a release tool made by AMP (Cat. No. 726534-1), unclip the 0.75² brown (br) wire from terminal jack 14 and the 0.75² black (bk) wire from terminal jack 13 of the 14-pin plug.
Slacken the 4 fastening bolts in the blower cover and detach the blower cover.
Unscrew the 3 fastening bolts and detach the combustion air blower.

Please note!
Before proceeding with assembly work, carefully check the seal between the combustion air blower and the combustion chamber. Renew if necessary.

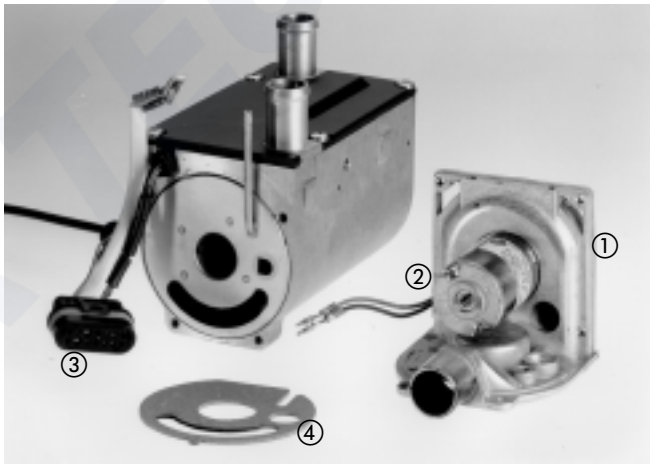


Fig. 6

① Combustion air blower
② Electric motor
③ 14-pin plug
④ Seal

Removing the combustion chamber (see Fig. 7)

- Remove control unit

Slacken the 3 fastening bolts in the combustion air blower.
Lay the combustion air blower aside (the cable harness of overheat sensor and temperature sensor must not be removed).
Remove the combustion chamber from the heat exchanger.

Please note!
Before proceeding with assembly work, carefully check the seals. Renew if necessary.

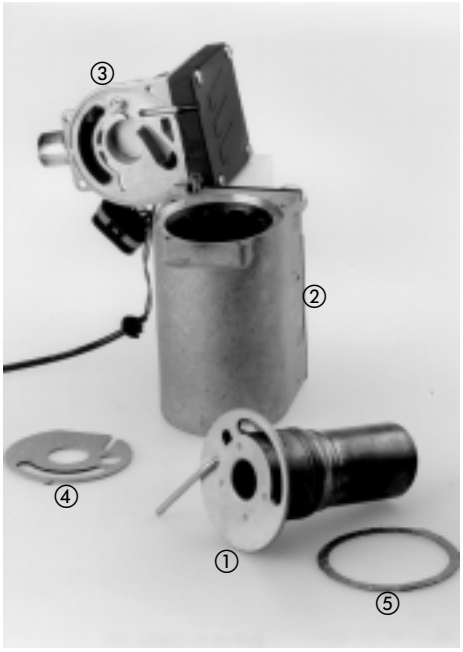


Fig. 7

① Combustion chamber
② Jacket with heat exchanger
③ Combustion air blower
④ Seal — combustion air blower / combustion chamber
④ Seal — combustion chamber / heat exchanger

Removing the overheat sensor and temperature sensor
(see Fig. 8)

Remove control unit, blower cover and heat exchanger cover. Slacken the compression spring fastening bolt and detach the compression spring. Remove the overheat sensor and temperature sensor from the locating hole in the heat exchanger with flat nose pliers.
Using a release tool made by AMP (Cat. No. 726534-1), unclip the two wires of the temperature sensor (terminal jack 3 0.5² blue (bl) and terminal jack 4 0.5² blue (bl)) and the two cables of the overheat sensor (terminal jack 5 0.5² red (rt) and terminal jack 6 0.5² red (rt)) from the 14-pin plug.

① Overheat sensor
② Temperature sensor
③ Compression spring

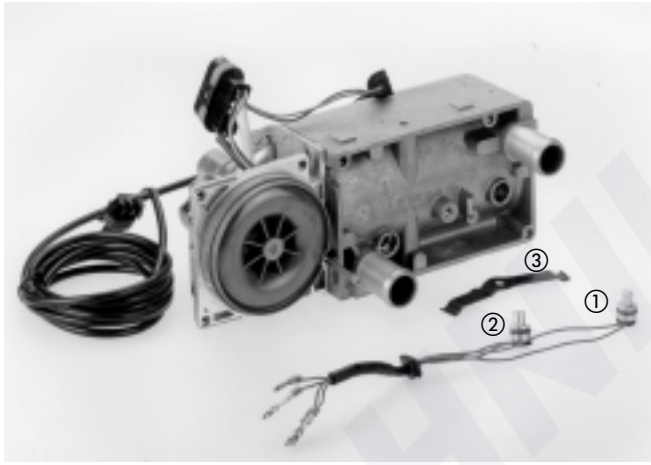
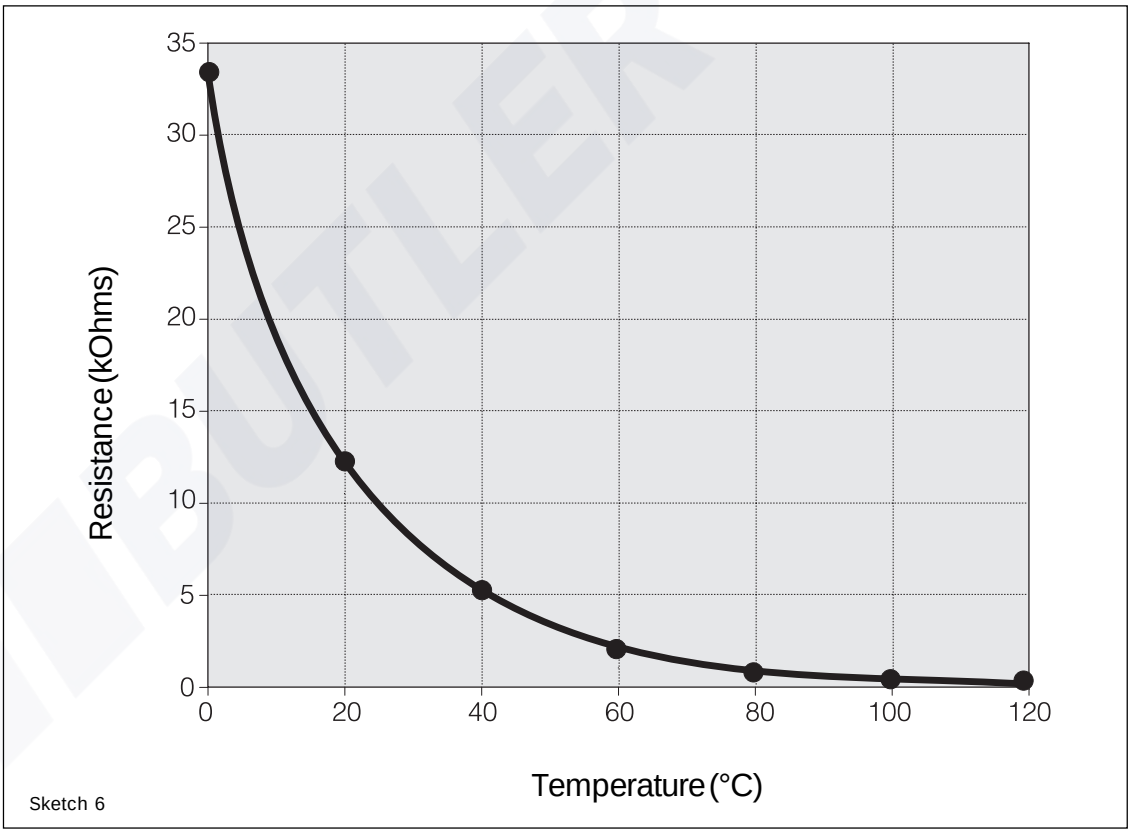


Fig. 8

Checking overheat sensor and temperature sensor
(see page 6)

Check the overheat sensor or temperature sensor using the Digital Multimeter. If the resistance value of the overheat sensor or the temperature sensor lies **outside** the table of values or the diagram, then replace the overheat sensor or temperature sensor.

Please note!
The overheat sensor, temperature sensor and cable harness form a module, which means that they are not available as component parts.
Before installation, coat the O-rings of the overheat sensor and temperature sensor with special-purpose grease, e.g. “Hellerine”.



Sketch 6

Table of values

Temp. [°C]	0	10	20	30	40	50	60	70	80	90	100	110	120
R [kΩ]	32,54	19,87	12,48	8,06	5,33	3,60	2,48	1,75	1,25	0,91	0,67	0,50	0,38
Vref [V]	4,275	3,960	3,561	3,100	2,611	2,135	1,705	1,339	1,041	0,805	0,622	0,483	0,376

Removing the heat exchanger (see Fig. 9)

- Remove control unit
- Remove combustion air blower
- Remove combustion chamber

Pull the overheat sensor and temperature sensor out of the locating hole in the heat exchanger with flat nose pliers.
Press the heat exchanger through the water connection (water inlet) and out of the jacket using a screwdriver.
Perform a visual inspection of the heat exchanger. Clean or renew the heat exchanger if necessary.

① Heat exchanger
② Jacket
③ O-ring
④ Water connection (water inlet)

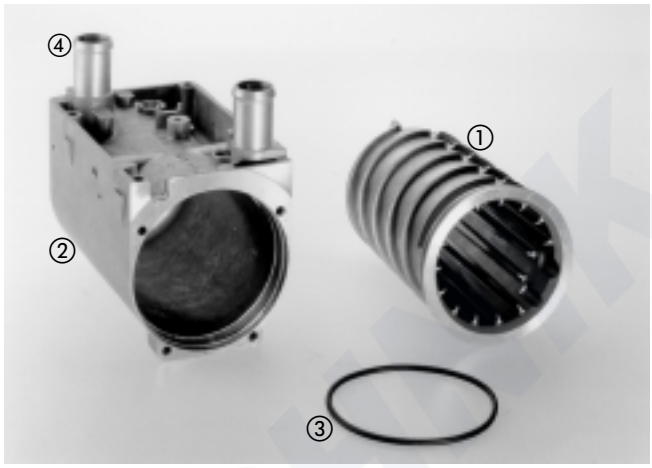


Fig. 9

Installing the heat exchanger (see Fig. 10)

Insert the heat exchanger into the jacket. The heat exchanger must be installed so that the slot in the heat exchanger base catches the detent of the jacket base. As a point of reference, the overheat sensor connection must match up with the locating hole in the jacket.

Please note!
Before proceeding with assembly work, carefully check the seals and the O-ring. Renew if necessary.
Check that the heat exchanger is properly seated in the jacket (the heat exchanger must be pressed firmly into the jacket).
Before installation, coat the O-rings with special-purpose grease, e.g. “Hellerine”.

① Heat exchanger
② Jacket
③ Detent
④ Slot in base of heat exchanger
⑤ Base of overheat sensor

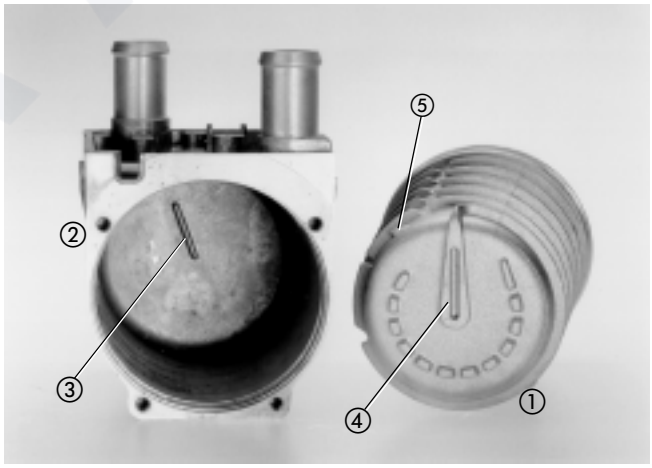
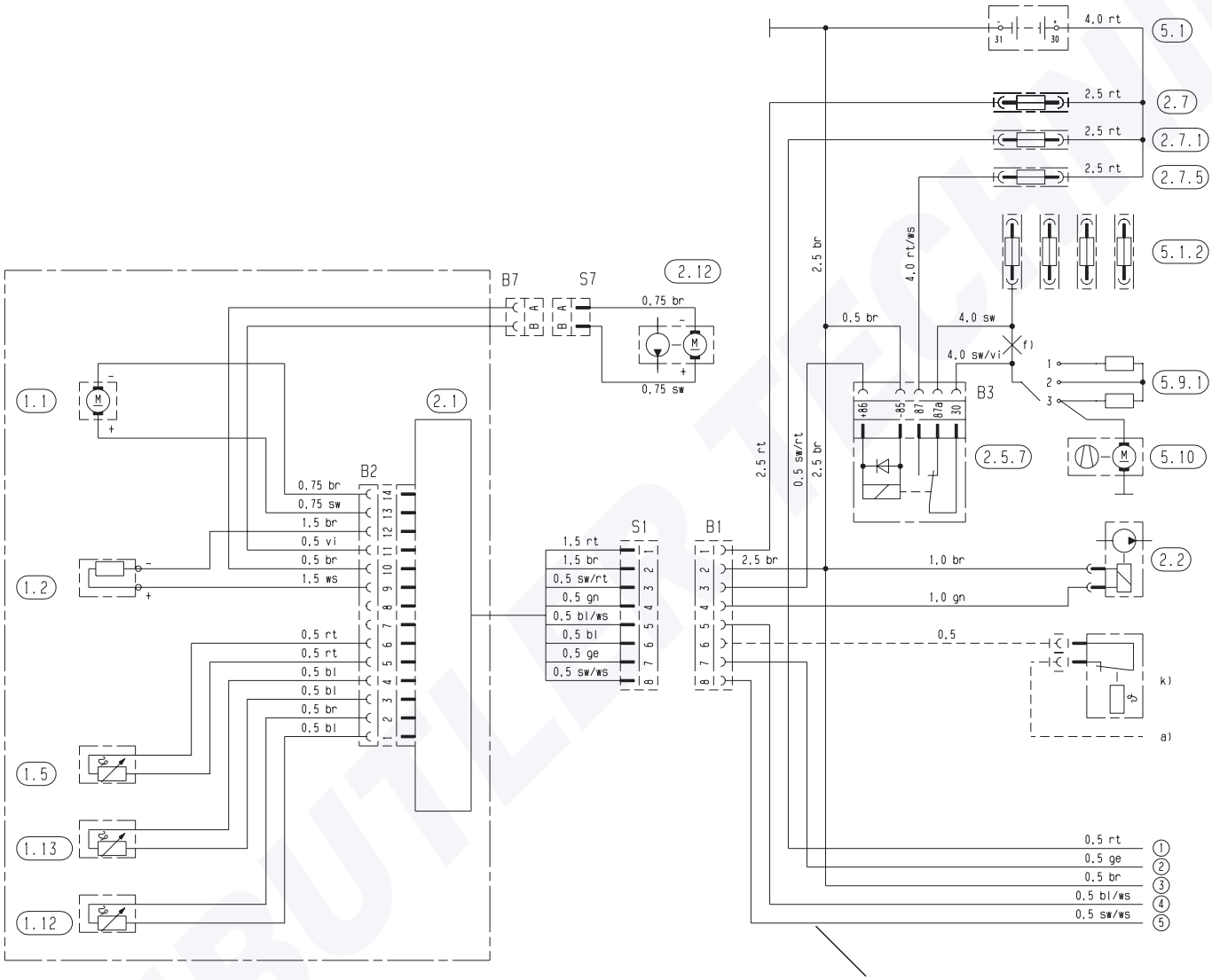
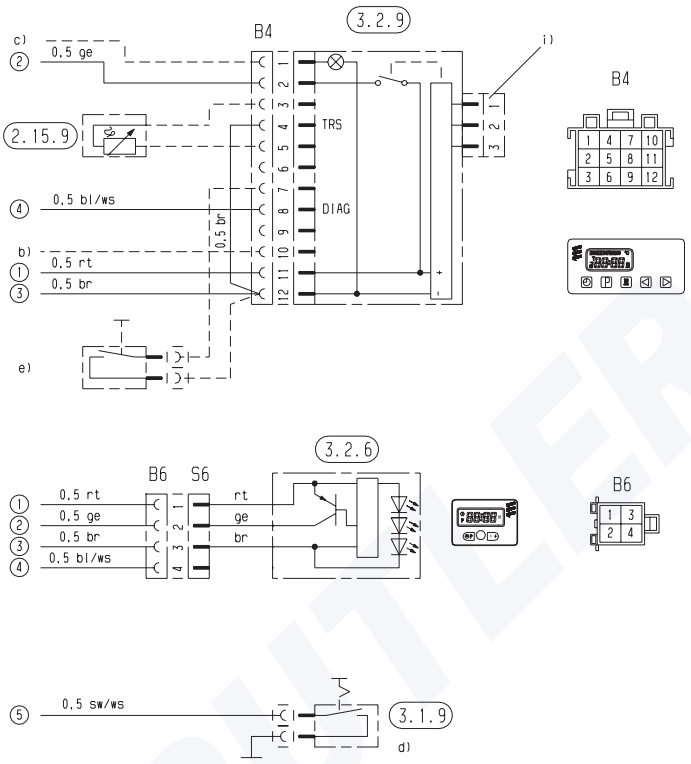


Fig. 10

Wiring diagram
***HYDRONIC* B — 12 Volts and *HYDRONIC* — 12 Volts / 24 Volts**





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Parts list

1.1 Burner motor
1.2 Glow plug
1.5 Overheat sensor
1.12 Flame sensor
1.13 Temperature sensor

2.1 Control unit
2.2 Metering pump
2.5.7 Relay, vehicle blower
2.7 Main fuse 20 A /12 V-15 A/24 V
2.7.1 Fuse, actuating element 5 A
2.7.5 Fuse, vehicle blower 25 A
2.12 Water pump
2.15.9 Sensor, outside temperature

3.1.9 Switch, stationary ventilation
3.2.6 Timer, “Mini” version
3.2.9 Timer, rectangular (modular timer)

5.1 Battery
5.1.2 Fuse holder in vehicle
5.9.1 Switch, vehicle blower
5.10 Vehicle blower

a) Connect to D+ for add-heat criterion (optional)
b) connect to +15
c) Lighting terminal “58”
d) Stationary ventilation (optional, see page 15)
e) External ON/OFF key (optional)
f) Cut open cable
i) Radio module connection
k) Switch (additional heating, e.g. <5°C)

Length plus + length minus:
from 3.5 m to 5.5 m ——> cross-section 4 mm²
from 5.5 m to 8.0 m ——> cross-section 6 mm²

Insulate unused cable ends.
The plug and socket housing are shown from the conductor entry side.

Rt = red
bl = blue
ws = white
sw = black
gn = green
gr = grey
ge = yellow
vi = violet

Please note!
In the case of vehicles equipped with heating or air conditioning system, please observe our vehicle-related Workshop Information on the blower control.
If the Workshop Information is unavailable, pay attention to the vehicle manufacturer’s instructions regarding connection or interface for blower control.

Fuel quantity measurement

Preparations for measurement (see sketch 7)

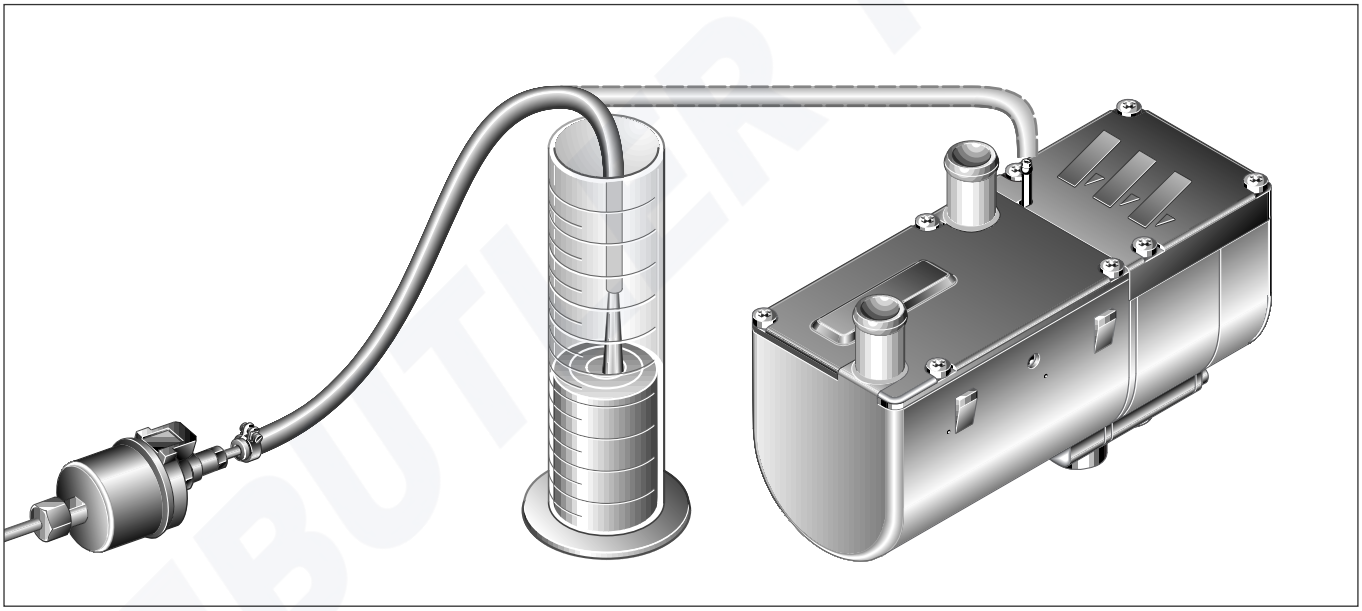
Detach the fuel line from the *HYDRONIC* and place it in a measuring glass (10 cc. capacity).
Switch on the *HYDRONIC*.
After about 45 seconds, the metering pump starts to pump fuel.
When the fuel is coming out smoothly and free of bubbles, the fuel line is filled and bled.
Switch off the heater and empty out the measuring glass.

Please note!

Only perform fuel quantity measurement if the battery is charged sufficiently!
During measurement, the voltage applied to the control unit must be at least 11 Volts/23 Volts and must not exceed 13 Volts/25 Volts.

Measurement

Switch on the heater.
After about 45 seconds, the metering pump starts to pump fuel.
Keep the measuring glass at the level of the *HYDRONIC* during measurement.
After about 90 seconds, fuel pumping is switched off automatically.
Switch off the heater, as otherwise start-up is repeated.
Measure the fuel quantity in the measuring glass.



Sketch 7

Evaluation

Compare the measured fuel quantity with the values specified in the following table.
If the measured fuel quantity is above the max. permissible value or below the min. permissible value, the fuel metering pump must be replaced.

Fuel quantity	*HYDRONIC* B 5 W S	*HYDRONIC* D 5 W S
Nominal fuel quantity	11.5 cm^3/90 sec.	8.0 cm^3/90 sec.
Max. fuel quantity	12.1 cm^3/90 sec.	8.5 cm^3/90 sec.
Min. fuel quantity	10.9 cm^3/90 sec.	7.5 cm^3/90 sec.